

### REMARKS

The Office action of April 7, 2005, has been carefully considered.

Claims 24-32 and 34-46 have been rejected under 35 USC 112, first paragraph, for failing to comply with the enablement requirement. The Office action states that it is not clear how one can obtain an integral fiber preform having uniformity and thickness and uniformity in fiber volume along the entire length including nodal points or points of intersection.

As noted previously, the WO '932 reference discloses tailored fiber placement technology, and was available at the time of filing of the present application. However, the Office Actions states that this reference does not incorporate any sewing or stitching operation, which is alleged in the Office Action to add to fiber volume at the nodes or points of intersection of the continuous fibers.

Applicants now submit a further reference available at the time of filing of this application, Mattheij et al, "Tailored Fiber Placement-Mechanical Properties and Applications," J. Reinforced Plastics and Composites, Vol. 17, No. 9 (1998), pp. 774-786.

This reference provides a detailed explanation of the tailored fiber placement process, as was known at the time of filing of the present application. The process is based on embroidery techniques, and enables the production of fiber preforms with stress field aligned fiber orientations.

As discussed on page 775 of this article, a roving is fixed on a base material by stitching with a needle yarn. Between the stitches, the base material is moved in the x,y direction. The method enables generation of desired geometries, and hence grids can be generated without a

problem.

In the region of the intersection points, additional sewing threads are not required, since due to the fixation of the fibers on rovings outside of the intersection points, fixation at the intersection points is automatic.

As the Mattheij et al reference makes clear that stitching as is used according to the claimed invention was known in the art, withdrawal of this rejection is requested.

Claims 24, 26-31, 38, and 40-45 have been rejected under 35 USC 103(a) over Deckers et al in view of Kam et al and PCT '932, optionally further taken with either one of Kawasaki et al or Blad et al, and optionally further taken with Schmeal et al or Darrieux.

As described on pages 1 through 4 of the present specification, the invention is directed to a method for production of a grid which is typically used in high temperature furnaces. Such grids are used as bases which are resistant to high temperature and have high mechanical strength. Carbon fiber reinforced carbon grates have been used in the prior art for this purpose and in the past have been manufactured from strips or from plate material, which must be cut out in the region of interception points to insure that the bearing area of the grid extends in the same plane, such that there is no thickening of the material in the region of the intersection points. Such grids or grates are self-supporting.

Claim 24 has now been amended to specifically recite that the grid is self-supporting, and to recite that the mold has voids for receiving the preform which are defined by flexible elements which follow shrinkage of the preform.

The self-supporting nature of the grid is clear from the disclosure of the specification, particularly from the

discussion of the use of the grid (page 7, penultimate paragraph; paragraph bridging pages 9 and 10). Indeed, a fiber component which was not self-supporting could not serve as a column base for a chemical reactor.

The recitation relating to the mold is found in the specification in the paragraph bridging pages 5 and 6, at page 8, lines 10-22, and in original claim 20.

Deckers et al does not relate to self-supporting grids. Rather, Deckers et al discloses a method for producing fiber reinforced structures in which fiber elements are used to reinforce a composite shell where the fibers can be arranged on the shell in the form of a grid. As noted in the Abstract, the Deckers et al invention is directed to placement of discrete, elongated fiber elements in mutually superimposed relationship to define reinforcement or stiffening members on fiber elements for the interiors or exteriors of composite shells and the consolidation of the fibers to form a cured composite structure.

The reinforcement of Deckers et al cannot be handled by itself if there are not greater thicknesses in the intersection point than in the adjoining regions. While there is some possibility of arranging the fibers end-to-end, instead of overlapping, the fiber strand must be cut for this purpose. As a result, there is inherently a gap in the intersection point, but even if this were not present, a corresponding grid would not be usable by itself since the fiber tows in the intersection point have no cohesion.

Thus, Deckers et al does not disclose or suggest making a fiber composite component in the form of a grid usable by itself, and it is not disclosed or suggested to use tailored fiber placement technology.

Similarly, the Kam et al reference relates to a method

for producing a fiber reinforced shell. The inside of this shell is lined with the grid structure, and according to column 2, lines 64 et seq, any suitable combination of high strength reinforcing fiber and organic polymeric binder can be employed to obtain a stiffening member. The preferred composite material is a graphite-epoxy composite formed from chopped graphite fibers impregnated with epoxy resin, as disclosed at column 3, lines 7 through 10. Clearly, there is no disclosure or suggestion of utilizing a grid formed utilizing fiber placement technology and Kam et al does not disclose or suggest that the reinforcing structure may be used as an independent grid.

PCT '932 discloses, as noted, above the tailored fiber placement method for forming a grid. However, as in the case of Deckers et al and Kam et al, this reference discloses making a reinforcing structure applied to one surface of an object. The process as disclosed is generally utilized in the aviation and aerospace technology industries.

Thus, the combination of Deckers et al, Kam et al and PCT '932 suggests, at most, utilizing tailored fiber placement technology to form a reinforcement for an object, but not a grid to be utilized alone, such as in a high temperature furnace.

The Kawasaki et al reference has been discussed in detail in previous responses, and discloses a fiber grid reinforcement of a flat shape with first and second directions perpendicular to each other. First fiber bundles extend along the first direction and second fiber bundles extend along the second direction, with the second fiber bundles intersecting perpendicularly the first fiber bundles. In accordance with the abstract and the specification at column 3, lines 19 et seq, each of the second fiber bundles includes a greater

number of fibers than each of the first fiber bundles, such that the fiber grid reinforcement has a greater flexibility in the first direction than in the second direction. This leads one to the conclusion that the quantity of fibers in the intersection points is greater than other points, and as disclosed at column 3, lines 25 *et seq*, the bulge at the intersection should be compacted to the same thickness as the other sections of the fiber grid. Considerable pressure has to be expended to achieve a cross section of equal thickness, thus risking breaking of the fibers.

Similarly, the Blad et al reference contains no suggestion to make a grid based upon a preform which is made according to fiber placement technology. Instead, Blad et al discloses a reinforcement structure with a first layer of resin and a second layer of filled resin continuous with the first layer, which for example, is applied to a pipe. There is no suggestion of a grid corresponding to the teaching of the present invention.

Schmeal et al and Darrieux disclose that fibers should be secured and retained during a placement operation. There is no suggestion to use tailored fiber placement technology. In particular, Figs. 12-14 of Darrieux show that a self-supporting grid with at least one point of intersection with an equal fiber volume and an equal thickness is not disclosed or suggested.

Withdrawal of this rejection is requested.

Claims 25, 32, 34-37 and 46 have been rejected over the above combination of references, taken further with Booth.

Booth discloses a grids made of carbon strands in which the node points have a greater density and thickness than the adjoining regions. Thus, Booth does not cure the defects of the above-cited references, and withdrawal of this rejection

is requested.

Claims 40-42 have been rejected under 35 USC 103 over the above combination of references, taken further with Handermann or Kent et al.

The Handermann reference discloses production of prepregs using reinforcing fibers without any reference to making grids with at least one intersection or node point having a substantially constant material thickness and substantially constant fiber volume. There is no disclosure or suggestion of producing a grid which is usable by itself.

The Kent et al reference discloses the manufacture of fiber reinforced laminates, and also does not disclose a grid as presently claimed.

Withdrawal of this rejection is requested.

In view of the foregoing amendments and remarks, Applicants submit that the present application is now in condition for allowance. An early allowance of the application with amended claims is earnestly solicited.

Respectfully submitted,



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